NO. 2, JUNE 2010

Acid News

Shipping industry must pay the bill

It is not acceptable that shipping industry keeps on transferring the cost of its pollution to society at large.

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Low-carbon Europe costs less than nothing

European greenhouse gas emissions could be cut by 80 per cent by 2050 - and it would cost less than doing nothing, a new study claims.

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Go green - go slow

The overcapacity in the cargo fleet creates an opportunity to reduce emissions by simply sailing slower.

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Particles killing half a million

Air pollution by fine particles is estimated to cause half a million premature deaths in European countries every year.

According to a recent study by the European Topic Centre on Air and Climate Change (ETC/ACC) on behalf of the European Environment Agency (EEA), pollution of fine particles is associated with more than 455,000 premature deaths every year in the EU's 27 member states, corresponding to almost 4.5 million years of life lost.

Maps showing pollutant concentrations may serve as input to studies assessing the health impacts of exposure to air pollution. In the case of fine particles ($PM_{2.5}$), monitoring activity is as yet too limited to prepare such a concentration map for Europe based solely on monitoring data. A mapping procedure was therefore developed that combines the scarce $PM_{2.5}$ monitoring data with the more abundant PM_{10} monitoring data. Figure 1 shows the resulting $PM_{2.5}$ map, which was used to compare the current (2005) concentrations with the limit and

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Acid News

A newsletter from the Air Pollution & Climate Secretariat, the primary aim of which is to provide information on air pollution and its effects on health and the environment.

Anyone interested in these matters is invited to contact the secretariat. All requests for information or material will be dealt with to the best of our ability. Acid News is available free of charge.

In order to fullfill the purpose of Acid News, we need information from everywhere, so if you have read or heard about something that might be of general interest, please write or send a copy to:

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The Air Pollution and Climate Secretariat
The Secretariat has a board consisting of one representative from each of the following organizations: Friends of the Earth Sweden, Nature and Youth Sweden, the Swedish Society for Nature Conservation, and the World Wide Fund for Nature Sweden.

The essential aim of the Secretariat is to promote awareness of the problems associated with air pollution and climate change, and thus, in part as a result of public pressure, to bring about the needed reductions in the emissions of air pollutants and greenhouse gases. The aim is to have those emissions eventually brought down to levels that man and the environment can tolerate without suffering damage.

In furtherance of these aims, the Secretariat:

- Keeps up observation of political trends and scientific developments.
- Acts as an information centre, primarily for European environmentalist organizations, but also for the media, authorities, and researchers.
- Produces information material.
- Supports environmentalist bodies in other countries in their work towards common ends.
- Participates in the lobbying and campaigning activities of European environmentalist organizations concerning European policy relating to air quality and climate change, as well as in meetings of the Convention on Long-range Transboundary Air Pollution and the UN Framework Convention on Climate Change.

Editorial

AirClim

Shipping must pay its bill

On 26 March, the United States and Canada hailed and praised the UN International Maritime Organisation's (IMO) adoption of an emission control area (ECA) all along the North American coastline (see article on p. 15).

Less than two months later a group of European industry and shipowner organisations sent an open letter to the EU, claiming that the ECA sulphur standards are "unacceptable", and urging the EU to act "to amend the IMO decision."

Currently, ocean-going ships burn extremely dirty fuels that contain on average 3,000 times the sulphur content of road diesel fuel – even in ECAs ships are allowed to burn fuel with 1,500 times more sulphur.

Five years from now, in 2015, the new ECA standards will apply. But even then shipping fuel can still contain 100 times more sulphur than road fuels are allowed to today.

In their letter to the EU, the industry groups claim that "the environmental benefits are questionable and might even be negative." But they fail to provide any evidence or references to substantiate this claim.

Damage to health and the environment by sulphur pollution is scientifically established and well-documented. That is why land-based emission sources in the EU have cut their sulphur outlets by 80 per cent since 1980. In the same time period, the shipping industry has evaded its fair share of responsibility, and instead markedly increased its emissions.

The industry groups complain about the expected increase in fuel costs. Clearly cleaner fuels are more expensive than dirty ones, but they also provide great health and environmental benefits.

The US EPA estimates that by 2030 the implementation of the ECA limits will prevent up to 32,000 premature deaths, 1.5 million work days lost, and more than 5 million cases of acute respiratory symptoms. Further, the annual monetised health benefits are estimated to amount to between US$110 and 280 billion, outweighing the costs (US$3.1 billion) by a factor of between 30:1 and 90:1, and making it an extremely cost-effective regulation.

The fact that the benefits are much higher than the costs becomes even more obvious if the very significant non-monetised environmental benefits are also considered, such as reduced acidification of ecosystems. Currently emissions from shipping in the Baltic Sea and North Sea ECAs are responsible for roughly a quarter of the total sulphur deposition on Sweden, Norway and Denmark.

Moreover, several studies have shown that the costs of cutting air pollutant emissions from ships are lower – sometimes much lower – than the cost of further reducing emissions from sources on land. So by cutting emissions from shipping, the EU could achieve its agreed and adopted health and environmental objectives at a lower overall cost to society as a whole.

The obvious way forward is for the EU and its member states to follow the example of the United States and Canada and designate all sea areas around Europe (the Baltic Sea, the North Sea, the North-East Atlantic, the Mediterranean and the Black Sea) as "full" Emission Control Areas, i.e. covering all the major air pollutants (sulphur, PM and NOx). (Currently only the Baltic Sea and the North Sea have ECA status, and this is limited to sulphur control.)

It is not acceptable for the shipping industry to keep on transferring the cost of its pollution to society at large. The IMO regulations must be fully implemented . To encourage the use of the best techniques, and to speed up the introduction of cleaner fuels and ships they should be complemented by economic instruments, such as emission charges.

Christer Ågren

And the winner is....

The dirty THIRTY

		Company	Plant	Emissions		Change, %
				2009	2008	
1	Poland	BOT Elektrownia	Belchatow	29.5	30.9	-4.5
2	Germany	RWE AG	Niederaussem	26.3	24.9	5.7
3	Germany	Vattenfall	Jaenschwalde	23.3	23.5	-0.9
4	UK	Drax Group	Drax	19.9	22.3	-11.0
5	Germany	RWE AG	Weisweiler	19.0	21.4	-11.2
6	Germany	RWE AG	Neurath	17.9	18.0	-0.4
7	Germany	RWE AG	Frimmersdorf	16.8	18.6	-9.6
8	Italy	Enel SPA	Brindisi Sud	13.0	14.9	-13.0
9	Greece	Public Power	Agios Dimitrios	12.9	11.8	9.5
10	Germany	Vattenfall	Bohlen	12.8	11.4	12.2
11	Poland	BOT Elektrownia	Turow Bogatynia	11.6	12.9	-9.7
12	Poland	BOT Elektrownia	Kozienice	10.7	10.0	6.8
13	Germany	Vattenfall	Schwarze Pumpe	10.7	12.5	-14.4
14	Greece	Public Power	Kardia	9.6	9.6	0.0
15	France	ArcelorMittal	Dunkerque	9.2	11.3	-18.6
16	UK	EDF	Cottam	8.4	10.2	-17.0
17	Germany	Vattenfall	Boxberg	8.1	9.3	-13.4
18	UK	E.ON	Ratcliffe on Soar	7.6	9.9	-23.2
19	Poland	BOT Elektrownia	Opole	7.4	6.9	7.3
20	UK	Scottish Power	Longannet	7.3	5.9	24.4
21	Poland	BOT Elektrownia	Rybnik	7.2	8.1	-10.8
22	Germany	Vattenfall	Boxberg	7.2	6.1	17.2
23	UK	EDF	West Burton	7.2	9.7	-25.7
24	Estonia	Eesti Elektrijaam	Narva	7.0	8.3	-15.0
25	Germany	GKM (RWE, EnBW & MVV)	Mannheim	6.6	7.1	-6.5
26	Germany	ThyssenKrupp	Duisburg	6.6	8.8	-25.0
27	Hungary	RWE AG, MVM, EnBW	Visonta	6.2	6.2	-1.1
28	Poland	BOT Elektrownia	Patnow I, Konin	6.1	7.1	-13.7
29	Germany	E.ON	Schkopau	6.1	6.3	-4.1
30	Romania	Termoelectrica	Turceni	6.1	7.4	-18.5
	TOTAL			348.1	387.8*	-10.2

*2008 TOTAL figure is sum of last year's top 30.

For a third straight year the Polish power plant Belchatow tops the list of Europe's dirtiest installations in 2009, European Commission data showed.

The lignite-fired Belchatow plant, run by state-owned utility BOT Elektrownia, belched out nearly 30 million tonnes of climate-warming carbon dioxide (CO_2) into the atmosphere last year, down 1.4 million tonnes from 2008 but still roughly equivalent to the total emissions of Estonia and Latvia combined.

The thirty biggest CO_2 polluters – also known as the "dirty thirty" – collectively emitted 348 million tonnes of CO_2 last year, down ten per cent from 2008 and twelve per cent below 2007 levels.

Released on April 1, the data showed that the total CO_2 released by all plants regulated by the EU's Emissions Trading Scheme (ETS) fell by over eleven per cent last year, primarily as a result of the impact on European industry of the global economic recession.

Coal-fired power plants made up 28 of the top thirty emitters, while the remaining two were steel plants: one in France and the other in Germany.

With twelve out of the top thirty, Germany was again home to most of Europe's biggest emitters. Second came Poland with six plants, and third the UK with five plants.

The Table shows a list of the EU's "dirty thirty" with emissions data for 2008 and 2009 in millions of tonnes of CO_2 equivalent.

Christer Ågren

Source: Reuters, 6 April 2010

COUNTRY	PREMATURE DEATHS
Austria	6900
Belgium	10700
Bulgaria	12300
Cyprus	1000
Czech Republic	13700
Germany	78000
Denmark	4200
Estonia	1000
Spain	35900
Finland	2500
France	34200
Greece	13400
Hungary	16200
Ireland	1400
Italy	65500
Lithuania	2800
Luxembourg	200
Latvia	2100
Malta	400
Netherlands	15000
Poland	39700
Portugal	10200
Romania	28700
Sweden	5400
Slovenia	1800
Slovakia	5800
United Kingdom	46200
Sum EU27	**455200**
Albania	2300
Bosnia and Herzegovina	3200
Switzerland	5000
Serbia and Montenegro	15100
Croatia	5800
Iceland	100
Norway	2700
Macedonia	2400
Sum Non-EU	**36600**
Total	**492000**

Table: Numbers of premature deaths per year attributable to exposure to $PM_{2.5}$ (based on year 2005 pollution levels).

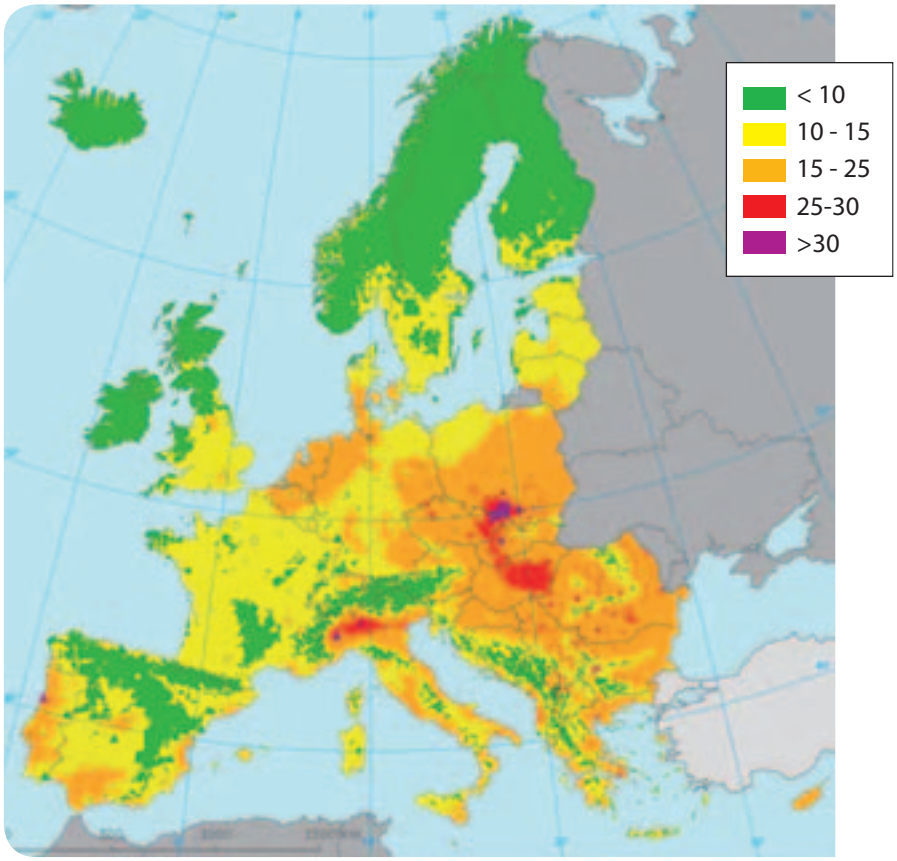


Figure 1: Annual average $PM_{2.5}$ concentrations for the year 2005.

Particles killing half a million

Continued from front page

target values as laid down in the EU's air quality directive *(see box)*.

The mapped results indicate that the annual mean level of 25 micrograms $PM_{2.5}$ per cubic metre ($\mu g/m^3$) is exceeded widely in Europe. This concentration – which in the directive is set as a target for 2010 and as a limit value for 2015 – was exceeded in twelve out of the 27 EU member states. As the spatial resolution of the $PM_{2.5}$ map is limited to an area of 10 by 10 kilometres this is likely to be an underestimate – more exceedances are to be expected at hot-spot locations, such as city centres, or areas with intensive road traffic.

It is estimated that nine per cent of the population was exposed to levels above the $PM_{2.5}$ limit value. In the same year (2005), more than a quarter of the population was exposed to concentrations above the PM_{10} short-term limit value (not more than 35 days per year with a daily mean above 50 $\mu g/m^3$). This indicates that the new $PM_{2.5}$ limit value for 2015 is less stringent than the short-term PM_{10} limit value, which was to be attained by 2005.

In this context it could be noted that the World Health Organisation recommends an air quality guideline value of 10 $\mu g/m^3$ as annual mean. The map indicates that more than 90 per cent of the population in Europe is exposed to concentration above this guideline.

In ten member states the average exposure indicator *(see box)* was well above the exposure concentration obligation of 20 $\mu g/m^3$ to be met in 2015. In another five countries this indicator was around the level of 20 $\mu g/m^3$.

The geographic distribution of premature deaths attributable to exposure to $PM_{2.5}$ is shown in figure 2, and the table provides country-by-country figures.

According to the study, $PM_{2.5}$ pollution in European countries is associated with more than 492,000 annual premature deaths, corresponding to almost 4.9 million years of life lost (YOLL) every year. These include 297,000 premature deaths caused by cardiopulmonary diseases and 54,500 premature deaths attributable to lung cancer. These numbers agree well with estimates made for the EU25 in

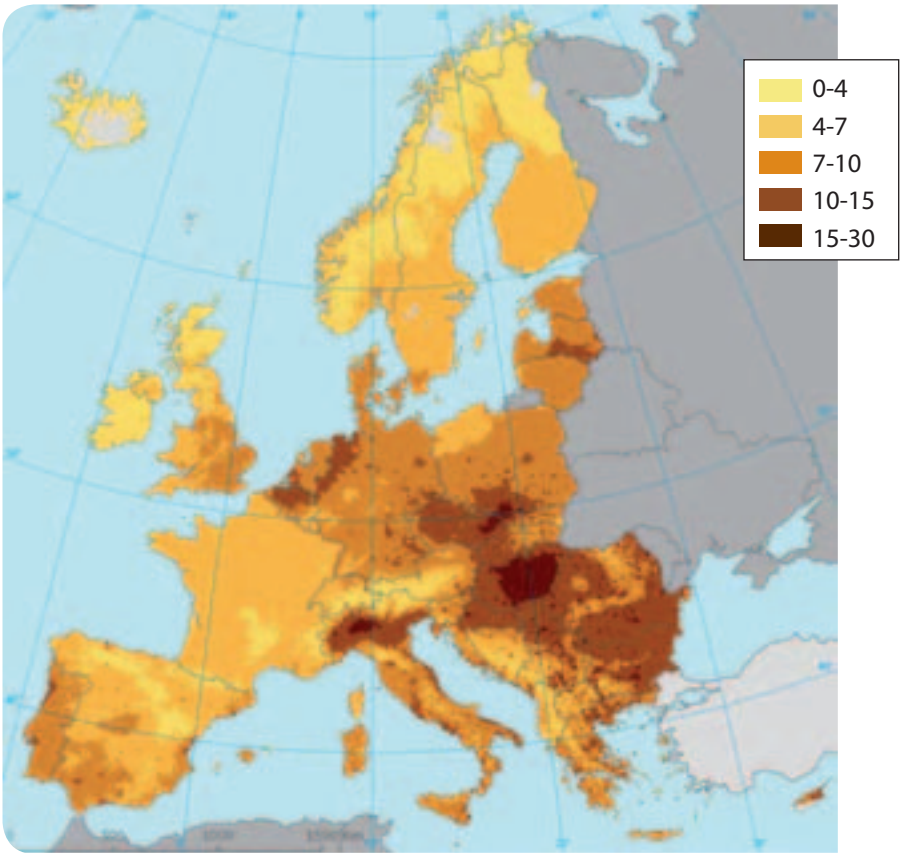


Figure 2: Premature mortality (expressed as deaths per 10,000 inhabitants/year) attributable to $PM_{2.5}$ exposure at year 2005 pollution levels.

the European Commission's Clean Air for Europe (CAFE) report, published in 2005.

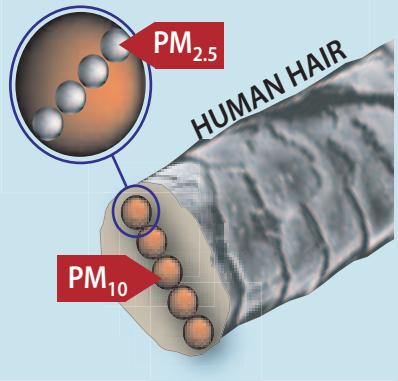
Christer Ågren

Assessment of the health impacts of exposure to $PM_{2.5}$ at a European level. ETC/ACC Technical Paper 2009/1 (June 2009). By F. de Leeuw and J. Horálek. Available at: *http://air-climate.eionet.europa.eu/reports/#tp*

Small particles targeted in EU directive

In May 2008, the EU adopted a new air quality directive establishing health-based standards and objectives for several air pollutants, including $PM_{2.5}$. An annual mean $PM_{2.5}$ concentration of 25 µg/m^3 is laid down as a target value to be attained in 2010 and as a binding limit value to be met in 2015. There is also a provisional limit value of 20 µg/m^3 for 2020.

In order to ensure more widespread health benefits, the directive introduced a mechanism aimed at a general reduction in concentrations. The average exposure indicator (AEI) is the average of concentrations at urban background locations throughout a country and it reflects the population exposure. A legally binding cap of 20 µg/m^3 is to be attained by 2015, and a percentage reduction is required to be attained by 2020, determined on the basis of the AEI value in 2010. According to the study, the exposure reduction target varies between countries, ranging from 10 per cent in Scandinavia to more than 25 per cent in eastern European countries.



PM stands for Particulate Matter. $PM_{2.5}$ are particles smaller than 2.5 µm in diametre, which is about 20 times smaller than human hair.

Commission take action on air quality failures

On 5 May the European Commission announced that it is pursuing legal action against Italy for failing to comply with EU air quality standards for dangerous airborne particles (PM_{10}). A second and final written warning has been sent to Italy for exceeding the limit values for PM_{10} in many zones or agglomerations across the country.

The Commission is also pursuing infringement proceedings against five other member states that failed to comply with the EU's air quality standards for airborne particles (PM_{10}). On 18 March, Slovenia and Sweden were referred to the European Court of Justice, while final written warnings were sent to Cyprus, Portugal and Spain. In a separate case, Bulgaria was sent a final written warning over its failure to control concentration levels of sulphur dioxide.

Source: Commission press releases 5 May and 18 April. Web link: *europa.eu/rapid/*

Controversial power plant upgrade

In late April, the Czech government gave the country's main utility CEZ the go-ahead for a disputed upgrade of the Prunerov power plant. The decision came after months of political wrangling within the government on whether or not to allow an upgrade one of the largest lignite-fired power plants in the country – with annual emissions of over 9 million tons, it is the country's biggest source of CO_2 emissions. The project is expected to extend the plant's lifetime by 20-25 years.

The decision was strongly criticised by environmentalists, including Greenpeace, who stated that the Czech ministry had taken a "shamefully manipulated political decision". Environmental groups expressed their disappointment that the government also disregarded concerns expressed by the Federated States of Micronesia (FSM). The tiny Pacific island state has contested the upgrade plans on the grounds that CEZ disregarded the power plants' potential impact on the climate and its contribution to sea level rise and extreme weather events.

Source: ENDS Europe Daily, 30 April 2010

Roadmap for 2050 offers low-carbon Europe for free

Cutting European greenhouse gas emissions by 80 per cent by mid-century is not only possible - it would cost less than doing nothing.

European greenhouse gas emissions can be cut by 80 per cent by 2050, according to a study by the European Climate Foundation, released in April 2010. This can be done with or without nuclear, and with or without carbon capture and storage (CCS). It will cost less than doing nothing, but it has to start pretty soon.

The European Climate Foundation (ECF) has presented a roadmap[1] for a low-carbon Europe (EU-27, Norway and Switzerland), prepared by several consultants, such as Oxford Economics, the Dutch ECN and McKinsey, which has prepared similar scenarios for Vattenfall power company.

In order to cut emissions by 80 per cent, the power sector must cut its emissions by almost 100 per cent. A number of paths are investigated, summarised in the table.

Measures outside the power sector are:

- Energy efficiency improvement of 2 per cent per year.
- Full phase-out of fossil fuels in buildings.
- Full phase-out of fossil fuels for transport, to be replaced by decarbonised electricity and second generation biofuels.
- All other identified emission abatement measures are implemented, such as CCS in industry and afforestation.

The power sector is nevertheless the most important. The 100 per cent renewables scenario is deemed possible, but is less explored. The 80 per cent renewables scenario is summarised in the figure, so as to give some detail:

The coal retrofit CCS is an option limited to plants built "capture ready". All other CCS is new-build. PV is photovoltaic solar cells. CSP is concentrating solar power, where water is heated to steam to produce electricity; the plants are assumed to have sufficient heat storage capacity for six hours production during night or shade. This means that it is not quite intermittent.

The 100 per cent renewable scenario is in fact the above plus some more geothermal plus imports of solar CSP from North Africa, which is what the Desertec project aims at, but without any nuclear or CCS.

The intermittency problem is manageable from a technical point of view, according to the ECF, but demands a lot of new power lines and back-up plants. For example the RE80 needs 270 gigawatts of backup plants compared to 120 gigawatts for the baseline.

The need for transmission (power lines) is daunting. The existing regional interconnections now amount to 34 GW, which admittedly is a mix of apples and oranges as they differ in length. But with the same measure, about 165 extra GW will be needed, almost five times as many power lines as today. Assuming demand-side reduction measures, this can be shaved to 125 GW.

This demand reduction (DR), or moving the time for when power is consumed within the day, is a critical issue. The underlying assumptions for the DR are that the electrification of heating includes local heat storage, and that the electrical vehicles' charging cycle is managed.

These may be conservative assumptions; there may be considerably more ways to shave peaks, if the price signal is strong enough.

The four issues of DR, new power lines, electricity storage and need for backup power are linked. The ECF assumes no electrical storage other than existing pumping hydro (running hydropower backwards some of the time, to provide extra capacity when needed) and some storage at solar CSP plants. The more DR there is, the less need for backup, storage and power lines, which can save tremendous amounts of money, and time. Some of the new power lines are solely needed to transport the electricity from, for example, offshore wind in the North Sea to big cities on the continent and in England. But some of the extra power lines are there to handle variations in supply, and these can be cut by more DR, which is much cheaper.

New backup power is also expensive, but it is a conservative assumption that of the existing hydro, only pumped storage can be used for storing power. At present, the regular hydropower dams act as electricity reservoirs and could be used more so, especially if nuclear power is phased out. Nuclear power is intermittent in another fashion than renewables, but when a reactor scrams, it goes unpredictably from full power to zero in seconds, which never

1) www.roadmap2050.eu/

Table: Power mix scenarios for 2050 (per cent)

	Baseline*	RE40	RE60	RE80	RE100
Renewables	34	40	60	80	100
CCS	0	30	20	10	0
Nuclear	17	30	20	10	0
Coal/gas w/o CCS	49	0	0	0	0

* The baseline scenario comes from the International Energy Agency's (IEA) World Energy Outlook 2009.

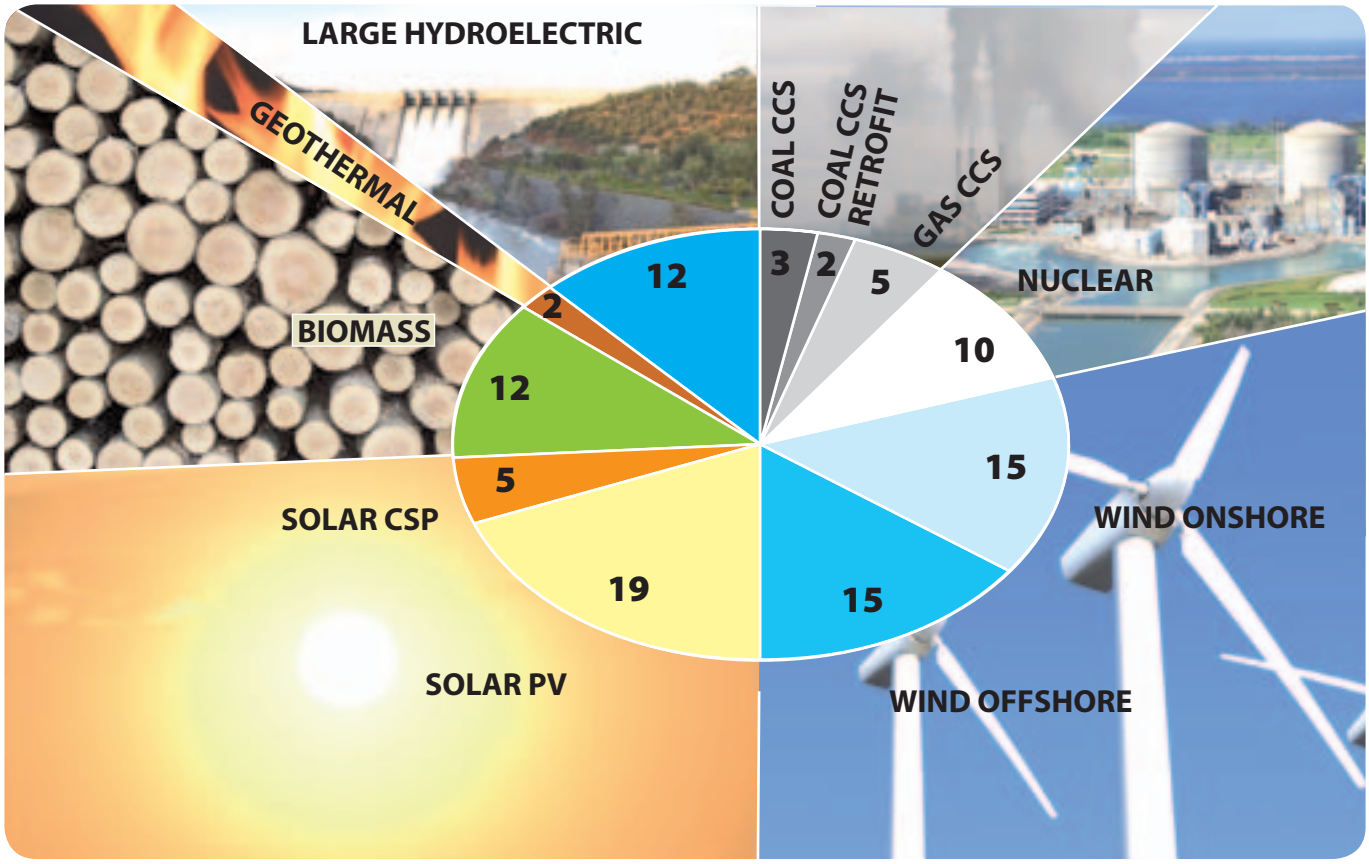


Figure: Power sector mix in scenario RE80 (per cent). Solar PV = photovoltaic. CSP = Concentrating solar power. For further explanations, see text.

happens with wind power. This was why the pumped storage facilities were built in the first place. These and other flexible supplies can be used to balance renewables; but they can't do both.

With a large wind power component, there can be too much wind power. This can be dealt with by idling some wind capacity some of the time. This seems a waste, but it does not need to be very big. In the RE80 this "curtailment" loss of renewable electricity is 2–3 per cent.

The study shows that a combination of solar and wind is more stable than wind alone. Biopower is both stable and can balance wind. Geothermal is stable, but cannot balance.

The ECF scenarios assume no wave power. This again may be conservative. If wave power can be mastered, the potential is huge, and the load is both smoother, more predictable, and not in phase with wind power; when the wind slows, the wave height falls several hours later.

In short, a high penetration of intermittent renewables may present a big problem. But that big problem can be salamied into a number of more manageable slices!

In the baseline scenario, the power demand is assumed to increase 40 per cent over the 40 years up to 2050. From that level, ECF cuts back by 30 per cent through efficiency gains but then again adds back about the same amount due to electric transport, heat pumps for heating and cooling and some increased use in industry.

This all-big, all-electric vision is not what all environmentalists wish for, but it does show that there are choices to be made, and that the do-nothing option is in many respects the worst.

The cost exercises show that there is not a very big difference between the choices, though a large share of renewables means high capital costs early on, and then lower costs for operation and maintenance later, while keeping fossil fuels will be ever more expensive. Compared to the baseline, the decarbonised path decreases energy costs 9 per cent by 2020 and 25 per cent by 2050 – assuming an oil price of only $115 by 2050.

Acording to the study, the short-term implications for achieving its objectives are, for example:

- Establish a framework for EU-wide solutions, especially for interregional grid planning.
- Ensure adequate incentives and funding for the required investments, including early success in energy efficiency.
- Sound a loud and clear message to the market that decarbonisation will take place, and that investments ignoring this message will be risky.
- Develop commercial-scale biomass fuel supply.
- Ensure massive investments in new low-carbon power stations, and gas infrastructure for backup power.
- Development of hydrogen infrastructure.
- Develop heat pumps and thermal storage systems, smart grids that allow demand response (DR) and networked high-voltage transmission technologies.
- Develop functioning CCS systems.

As for jobs, decarbonisation creates many more jobs than are lost in the fossil sector, but the ECF states that "short-term interventions could ensure that employees in vulnerable industries and regions are appropriately supported, both in financial assistance and in skills retraining, in the transition years 2010–2020."

Fredrik Lundberg

Ozone, plants and climate - views and news

Climate strongly affects plant sensitivity to ozone, and ozone effects on vegetation can have important feedbacks on the climate.

Ground-level ozone is formed by precursor air pollutants, primarily nitrogen oxides and volatile organic compounds, and under the influence of solar radiation, concentrations of ground-level ozone have been increasing over the last century. It contributes to several environmental problems:

- It is toxic to humans and vegetation.
- It affects different materials adversely.
- It acts as a greenhouse gas.

In the 4th assessment report of the Intergovernmental Panel on Climate Change (IPCC, 2007), ground-level ozone (also known as tropospheric ozone) was estimated to be the third most significant greenhouse gas after carbon dioxide and methane, although the estimate for ozone is associated with larger uncertainty than for some other greenhouse gases.

It was already known in the 1990s that ozone was a greenhouse gas that contributed substantially to radiative forcing, i.e. the warming of the Earth. Unlike the long-lived greenhouse gases, such as carbon dioxide and nitrous oxide, tropospheric ozone varies temporally and spatially to a large extent. This makes it harder to estimate the contribution of ozone to greenhouse warming, which will vary with location and season. Atmospheric modelling has in the meantime improved. Fair estimates of the magnitude of ozone as a greenhouse gas can now be provided.

Since the 1940s, when the effects of photochemical smog, of which tropospheric ozone is a key component, were first investigated in Southern California, it has been known that even a modest elevation of ozone concentrations is harmful to plants. Photosynthesis and growth may be negatively affected as well as some quality traits of crops, for example. This has a strong link to the greenhouse effect. If ozone causes ecosystems to sequester less carbon dioxide from the atmosphere through photosynthesis, this will indirectly contribute to radiative forcing. The amount of carbon dioxide in the atmosphere will be higher compared to a situation where ozone does not impair photosynthesis and its removal of carbon dioxide from the air. The absolute level of this effect is not easy to assess, but in an attempt to do this a group of researchers[1] estimated this indirect contribution to the greenhouse effect by ozone to be of the same magnitude as the effect of ozone as a greenhouse gas in the atmosphere.

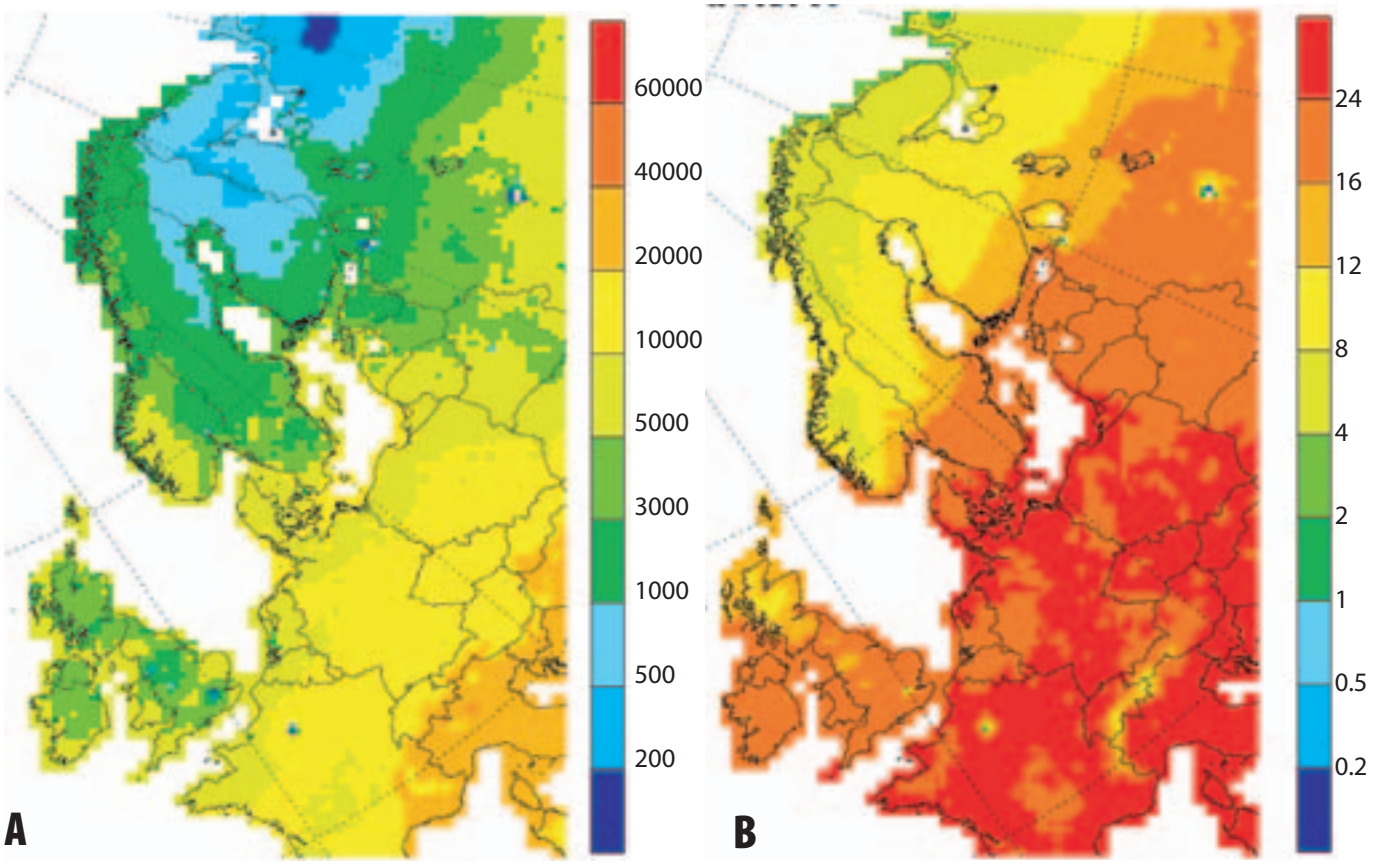
Characteristic leaf visible ozone injury on red clover.

In the last ten years scientists have been busy studying the influence of climate and meteorological factors on ozone impact to vegetation. Plants control their gas exchange by means of stomata, tiny pores on the leaf surfaces that can be open and closed, thus controlling leaf gas exchange. In situations when conditions favour photosynthesis – abundant sunlight, not too cold or too warm, not to dry air or soil – stomata will open to let carbon dioxide diffuse into the leaves as the substrate for photosynthesis. An inevitable price for this is that water vapour is lost to the atmosphere. Thus, when the soil or the air is dry, stomata will close to prevent drought effects or even wilting. Ozone has the same path into the leaves as carbon dioxide, through the stomata. Consequently, the dose of ozone taken up depends on the rate of leaf gas exchange. This has large consequences for risk assessment for ozone.

There is today strong evidence that the ozone uptake by plants depends on climate. In humid climates, such as much of northern and western Europe, ozone effects may be substantial, although ozone concentrations are lower than in the Mediterranean region, for instance. Here, ozone concentrations are strongly elevated, but low soil and air humidity limits plant ozone uptake. Still, ozone effects on vegetation are expected to be larger in the Mediterranean region, but not to the same extent as concentrations are higher. A map of ozone risk based on modelled ozone uptake by vegetation compared to one showing ozone exposure index sensitive only to the ozone concentration in the air is given in the figure *(right)*.

Climate change may enhance or limit ozone uptake by plants compared to current levels, depending on location. You can read more about risk assessment based on ozone uptake in a recent special issue of the scientific journal Ambio[2] on ozone effects on vegetation in Northern Europe.

New critical levels for ozone that are



Maps comparing estimated ozone exposure to deciduous trees. The left map (A) is based on the "old" concentration-based critical level (also known as AOT40), while the right map (B) is based on the "new" critical level, which reflects plants' uptake of ozone. Source: AMBIO, Number 8, December 2009.

based on the uptake of ozone by plants have been included in the Mapping Manual of the Convention on Long-range Transboundary Air Pollution (LRTAP). These new critical levels are likely to give a more realistic picture of the distribution of risk for ozone damage to vegetation than the previous ones based on ozone concentration exposure indices.

Historically, ozone effects on vegetation were mostly studied in North America and Europe. This is now changing. Emissions of ozone precursors, as well as ozone concentrations, have increased in densely populated areas with fast growing economies, such as China and India. In these countries, extensive scientific investigations of ozone effects on crops are now undertaken in response to environmental risks. In developing countries, adverse effects of air pollutants on agricultural production may have more severe consequences than in developed countries, since more people are directly dependant on food production to make a living and sustain their lives. The global map of ozone risk is changing as outlined in a recent book[3] on the interaction between air pollution and climate change.

It is well established that moderately elevated levels of ozone can be very harmful to human health. The heat wave in the summer of 2003 over much of Europe demonstrated this. The extreme weather conditions promoted ozone formation. In France, where conditions were very hot and ozone concentrations high, it has been estimated that approximately half of the substantial increase in mortality that occurred during the heat wave was due to ozone, and the other half to heat-related health effects. It has been suggested that conditions like those in the summer of 2003 may become more common in a future warmer climate.

Sometimes it is not necessarily the case that abatement measures against climate change also help to improve air quality, and the other way around. In the case of tropospheric ozone, however, it is clear that measures designed to reduce ozone concentrations will lead to reduced climate impacts as well as to less toxic effects for vegetation and humans. A reduction in methane emissions will not only reduce the contribution to climate change by this gas – methane is also an important ozone precursor, mainly acting to increase the background ozone concentrations over wide geographical areas.

Counteracting the levels of tropospheric ozone by reducing emissions of nitrogen oxides and volatile organic compounds, including methane, is a good example of a win-win abatement strategy, where both climate and air quality will benefit. It is important to make visible all the benefits associated with reduced emissions since the total cost is often explicit.

Håkan Pleijel

[1] **Sitch S, Cox PM, Collins WJ & Huntingford C (2007).** Indirect radiative forcing of climate change through ozone effects on the land-carbon sink. Nature 448, 791-794.

[2] **Karlsson PE, Pleijel H & Simpson D (2009).** Ozone Exposure and Impacts on Vegetation in the Nordic and Baltic Countries. Ambio 38, 402-405. Web site of the journal Ambio: *ambio.allenpress.com/perlserv/?request=index-html*

[3] **Pleijel H (Ed) (2009)**. Air pollution & climate change. Two sides of the same coin. Solna, Swedish Environmental Protection Agency. Available at: *www.naturvardsverket.se/en/In-English/Menu/State-of-the-environment/Air-quality/Air-pollution-and-climate-change/Chapters-from-Air-Pollution--Climate-Change/*

First ever greenhouse gas emission standards for US vehicles

The United States Department of Transportation and the Environmental Protection Agency (EPA) have jointly established new federal rules that set the first-ever national greenhouse gas emissions (GHG) standards and will significantly increase the fuel economy of all new passenger cars and light trucks sold in the country.

The standards that make up the first phase of the programme apply to passenger cars, light-duty trucks, and medium-duty passenger vehicles, covering model years 2012–2016. They require these vehicles to meet an estimated combined average emissions level of 250 grams of carbon dioxide per mile, equivalent to 35.5 miles per gallon (MPG) if the automobile industry were to meet this solely through fuel economy improvements.

The rules could potentially save the average buyer of a 2016 model year car US$3,000 over the life of the vehicle and, nationally, would conserve about 1.8 billion barrels of oil and reduce nearly a billion tons of GHG emissions over the lives of the vehicles covered.

Source: US EPA, 1 April 2010. Web link: *www.epa.gov/otaq/climate/regulations.htm*

Making the EU 100 per cent renewables-based

The European Renewable Energy Council (EREC), outlines in its new report "RE-thinking 2050" a pathway that would allow the EU to switch to a 100 per cent renewable energy supply for electricity, heating and cooling as well as transport, examining the effects on the EU's energy supply system and on CO_2 emissions. "The potential benefits of a future based on renewable energy are multiple: mitigating climate change, ensuring energy security and creating sustainable future-oriented jobs," points out Arthouros Zervos, President of EREC.

Source: EREC, 15 April 2010. Web link: http://www.erec.org/

ROBERT MIZENEK / FOTOLIA

Evaluating COP 15.

The poor legacy of Copenhagen

Commitments made after Copenhagen are far from sufficient to keep global warming below 2°C. Without further measures 3°C is more likely, and 5°C a possible scenario.

The Copenhagen climate summit last December failed to reach a binding agreement for the period after 2012, when the Kyoto protocol expires. To avoid complete failure, 114 states came up with a non-binding agreement, the Copenhagen Accord, on the very last night of the meeting. Another ten countries have signed later.

The Copenhagen Accord stated an aim of keeping global warming below 2°C, and reviewing a 1.5°C goal by 2015. However, no global or national emission targets were included. Signatory states were urged to fill in national pledges for emissions reduction targets for 2020 later. By mid-April, 76 countries, accounting for about 80 per cent of global industrial emissions, had done so. A group of scientists, most of them at the Potsdam Institute for Climate Impact Research, has investigated to what extent these commitments are sufficient to meet the 2 °C target. The result, recently published in Nature[1], is alarming.

The scientists find the national pledges made under the Copenhagen Accord amazingly meager and gives a few examples:

- The EU target of 20 per cent cuts will mean smaller annual reductions from now to 2020 than have been accomplished on average over the last 20 years.
- The United States provided a 2020 target of 17 per cent below 2005 levels, which is equal to no more than 3 per cent below 1990 levels. Canada has followed suit, which means that it is the only country effectively arguing for an increase of 2020 emission allowances above its current Kyoto protocol target: 3 per cent above instead of 6 per cent below 1990 levels.
- The less ambitious end of China's target (reducing CO_2 emissions rela-

1) **Rogerlj, J et al 2010:** Copenhagen Accord pledges are paltry. Nature, vol 464:1126-1128.

tive to economic growth by 40–45 per cent compared to 2005 levels) merely corresponds to business-as-usual development.

Only two developed countries have made sufficient pledges under the Copenhagen Accord. Japan´s target is 25 per cent below 1990 levels, and Norway aims at 30–40 per cent.

If all nations meet the ambitious end of their targets, annual emissions from developed countries in 2020 would be 15.7 Gt CO_2-eq, which is 15 per cent below 1990 levels. Recalling that the latest IPCC assessment called for a 25–40 per cent reduction, the shortcoming of the Copenhagen Accord becomes obvious.

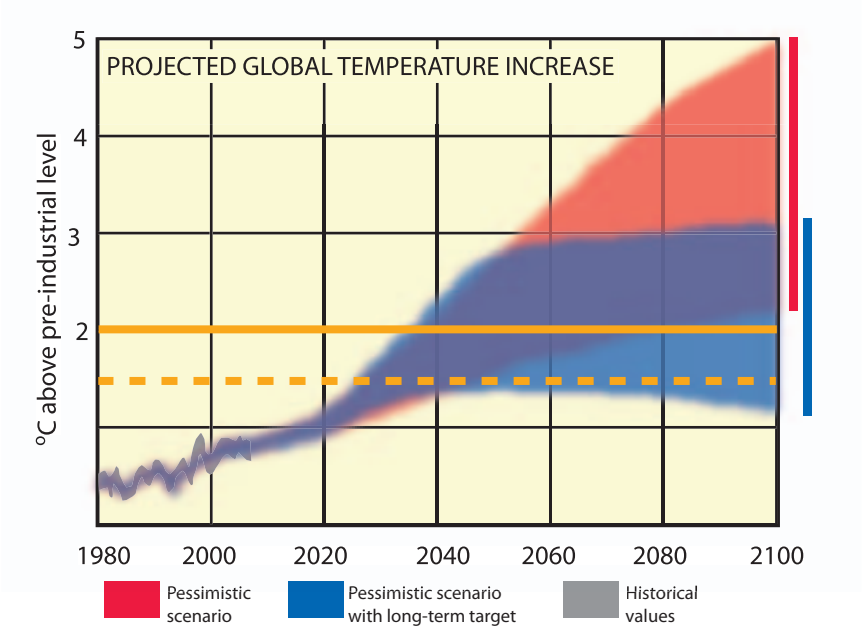
Furthermore, due to weaknesses in the system there are reasons to consider even more pessimistic scenarios. The most significant loophole is the possibility under the Kyoto protocol for nations to sell surplus emission allowances or to "bank" them for use after 2012. Some countries with weak Kyoto target are likely to generate large amounts of surplus allowances even without further efforts to reduce emissions. In the Nature article, it is estimated that they may add up to 11 Gt CO_2-eq annually. If all nations hit their lowest stated ambitions while taking full advantage of the loopholes, the annual emissions of developed countries by 2020 will be 6.5 per cent above 1990 levels. This actually exceeds business-as-usual projections.

In the worst-case scenario outlined above, total global emissions (including those from developing countries, deforestation, aviation and shipping) are estimated at 53.6 Gt CO_2-eq by 2020, while the best-case scenario stops at 47.9. This means that global emissions in 2020 would be 10–20 per cent higher than today.

Based on model simulations, the scientists conclude that even the optimistic scenario – 48 Gt emissions by 2020 – is far from being on track if global warming is to be kept below 2°C. On the contrary, it would require unprecedented emission cuts after 2020. "It is equivalent to racing towards a cliff and hoping to stop just before it," the authors state. Even if emissions are halved between 2020 and 2050, there is at best a toss-of-the coin chance of keeping warming under 2°C. The few pledges for 2050 made under the Copenhagen Accord so far rather suggest a 50 per cent chance that warming will exceed 3°C by 2100.

Roger Olsson

Projected global temperature increase in a pessimistic scenario, where nations meet only their lowest stated ambitions for 2020 under the Copenhagen Accord, while using all surplus allowances and land-use credits. The blue graph shows the same scenartio, but with halved emissions (compared to 1990 levels) from 2020 to 2050.



FRANCK STERNBERG / FOTOLIA

Time to say goodbye?

Ocean acidification faster than ever

Carbon dioxide (CO_2) emissions that contribute to global warming are also turning the oceans more acidic at the fastest pace in hundreds of thousands of years, according to the US National Research Council. "The chemistry of the ocean is changing at an unprecedented rate and magnitude due to anthropogenic CO_2 emissions," the council said. "The rate of change exceeds any known to have occurred for at least the past hundreds of thousands of years." Ocean acidification eats away at coral reefs, interferes with some fish species' ability to find their homes and can harm commercial shellfish such as mussels and oysters and keep them from forming their protective shells.

Source: Planet Ark, 23 April 2010

Higher pressure on Canadian oil sands

EU parliamentarians are raising the pressure on the Canadian oil sands industry, which they accuse of destroying forests and polluting the air and waterways. In April 17 members of the European Parliament wrote to EU climate commissioner Connie Hedegaard, urging her to maintain barriers to oil sands in draft EU standards to promote greener fuels. "The extraction and refining of tar sand oil is around three times more carbon intensive than conventional oil," they said in the letter.

Source: Reuters, 22 April 2010

NOx sources in the UK: the story behind the figures

Why the UK continues to live up to its "Dirty man of Europe" reputation despite being among the richer countries in Europe.

When data was published showing the EU-27's largest point sources of NOx pollution, two aspects attracted particular attention.

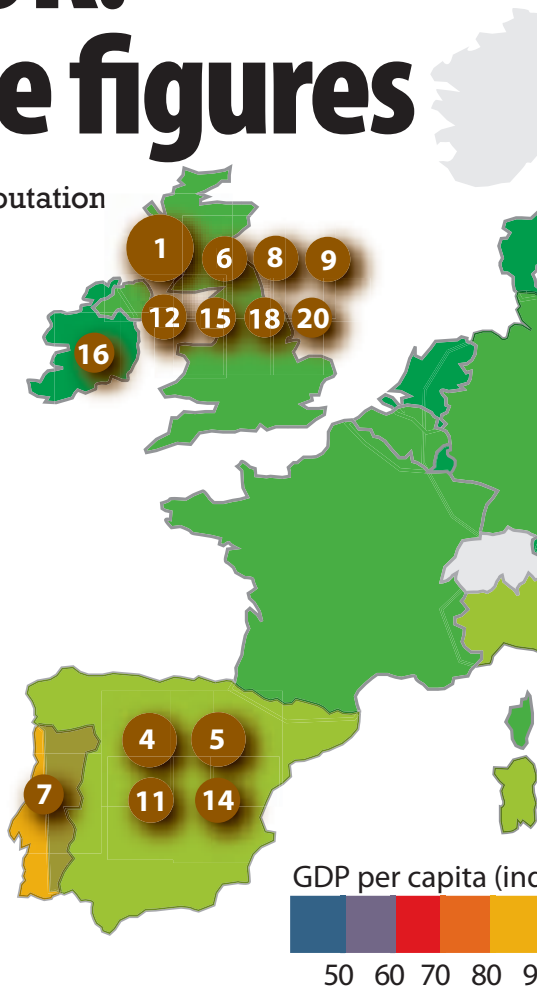
The first was the domination of these tables by the UK: 8 of the EU-27's top 20 NOx polluting plants were British. The second was that this domination of the tables occurred alongside countries with much lower GDP per capita incomes. Whilst the UK has an above-average GDP per capita income within the EU-27, others such as Poland, Bulgaria and Romania were much lower, with as little as 40 per cent of the average. So questions were asked as to why the UK continues to live up to its traditional 'Dirty Man of Europe' reputation in this way?

The issue of NOx control at UK large combustion plants goes back to the privatisation of the UK power sector back in the early 1990s, and the implementation of the UK's Integrated Pollution Control (IPC) industrial management regime This was the UK's very similar predecessor system to the EU's Integrated Pollution Prevention and Control (IPPC) system.

At this time, UK environmental groups presented evidence that advanced Selective Catalytic Reduction (SCR) NOx abatement technology should be employed at all UK power plants in addition to the much less effective but much cheaper low-NOx burners. However, this SCR evidence was rejected in favour of low-NOx burners only, given that all the UK power plant operators stated that they expected their coal-fired plants to close by 2010. Confidence in this decision was undermined by the fact that once this and a similar decision against the use of flue gas desulphurisation equipment (FGD) on any wider scale had been taken, it quickly became clear that the plants would remain open significantly beyond 2010.

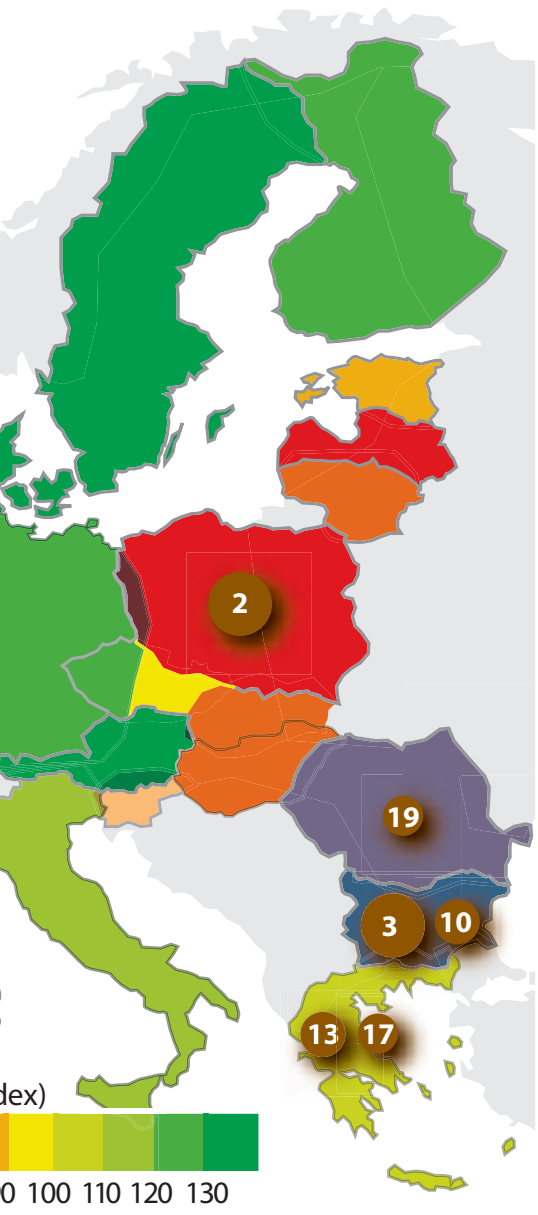
Given this 'new' information, attention focused on revisiting the FGD decision. However, this was only resolved on any significant scale when the UK's existing large combustion plants became subject to EU site-specific controls for the first time under the second EU directive regulating emissions from Large Combustion Plants (LCP), which came into force on 1 January 2008. In the negotiating process leading up to this directive, the UK had been instrumental in resisting a wider (then) EU-15 wish to see stronger controls on NOx emissions. As a result, existing coal-fired plants >500 MWth would not be required to fit SCR until 2016, when a NOx emission limit value of 200 mg/Nm^3 came into force.

It was against this background that the UK's coal-fired plants applied for their IPPC permits in March 2006. In these determinations, it was ironically the 2016 LCP directive NOx ELV that helped protect UK plants from having to fit SCR under IPPC. The expense of this technology could cause the UK's ageing plants to close or opt for peak load operation, and it was successfully argued that uncertainty about their long-term future undermined any justification for an IPPC NOx Best Available Techniques (BAT)



Top 20 NOx producing point sources in EU-27 **Source:** *The Swedish NGO Secretariat on Acid Rain/European Environmental Bureau.*

	Country	Site	Capacity (MWe)	Emissions estimate (kt)	
				Current	Using BAT
1	UK	Drax	3,960	58	7
2	Poland	Belchatow	4,340	40	2
3	Bulgaria	Maritsa II	1,450	39	2
4	Spain	Compostilla	1,312	35	2
5	Spain	Teruel	1,050	31	2
6	UK	Aberthaw	1,425	24	1
7	Portugal	Sines	1,256	23	2
8	UK	Ratcliffe	2,000	23	3
9	UK	West Burton	2,000	23	2
10	Bulgaria	Maritsa III	840	23	2
11	Spain	La Robla	620	23	1
12	UK	Cottam	2,008	22	3
13	Greece	Dimitrios	1,570	22	3
14	Spain	Velilla	-	21	-
15	UK	Kingsnorth	1,455	20	2
16	Ireland	Moneypoint	915	20	2
17	Greece	Kardia	1,200	20	1
18	UK	Ferrybridge	1,470	20	2
19	Romania	Turceni	2,310	20	1
20	UK	Longannet	2,400	19	2



Location of the top 20 NOx point sources (by country) and per capita incomes of the EU-27 Member States. Sizes of circles indicate amount of NOx emissions, figures refer to position on the top 20 list (see table). Map colors indicate gross domestic product (GDP) per capita, related to EU27 average (=100 in 2006). **Source** (GDP data): *Eurostat and Eustat.*

determination based on SCR. The BAT determinations therefore considered no period of possible operation beyond 2015, and were thus based on Boosted Over Fire Air (BOFA), a type of low-NOx burner. The UK BAT was set at 500 mg/Nm^3, the LCP directive emission limit value (ELV) for plants of this size, despite evidence submitted to the regulator by NGOs that BOFA can achieve much greater emission reductions than this.

However, one plant, Aberthaw, is distinctive among UK coal-fired plants in that it has a different type of boiler technology, designed to enable it to burn a particularly low volatility local coal. It is not technically possible to retrofit Boosted Over Fire Air to this type of boiler, so the regulator had to decide whether to require a less or more strict NOx ELV.

Everything in the plant's application suggested it should be stricter, and that Aberthaw should be required to fit SCR under IPPC. A key feature of this application that was of particular interest to environmental groups was the fact that it clearly stated that if Aberthaw was required to fit SCR, it would stay open beyond its 2018 deadline for meeting an LCP directive NOx ELV of 200 mg/Nm^3.[1] This meant that it would easily have enough operating time to amortise the debt of fitting SCR, and limited remaining plant life could not be used to evade a BAT determination based on SCR, which is the basis of the LCP BREF NOx BAT standard for existing plants of this size. Further, the cost per tonne of NOx abated if Aberthaw fitted SCR was well within cost data set out in the Economic and Cross Media BREF as having been judged to be reasonable in other EU member states.

However, despite all of this, Aberthaw managed to escape SCR, in part due to the UK's BAT assessment methodology. This methodology determines BAT as being the point on the cost curve where costs start to increase more rapidly, but this is a relative measure that takes no account of whether the costs are still reasonable in absolute terms beyond this point.

Further, the calculations presented in the application amortised the debt of fitting SCR over only 10 years, thereby overemphasising those costs. Environmental groups made representations to the regulator (the UK Environment Agency) on this count, but the response was to benchmark a decision against SCR using a consultants' study produced for the regulator that argued that even if the costs were amortised over 15 years, there was no economic case for fitting SCR to any UK power plant. But this study only reached its conclusion by using a methodology that is clearly stated as being inadequate in the Economic and Cross Media BREF and, as such, should never be used for BAT assessments.[2]

Friends of the Earth (FoE) in the UK looked to challenge the BAT determination legally, but was unable to do so because the BREFs are not legally binding and Member States are free to choose their own BAT assessment methodologies. This meant that any remaining case would amount to simply one technical opinion up against another, and FoE's lawyers advised that the English courts do not like such cases. In addition, proceeding with such a case could prove very expensive as each side countered the other with additional technical experts. FoE therefore regretfully decided against proceeding with any legal challenge of the Aberthaw NOx BAT determination.

Despite the publication of the damning UK NOx data in the EU tables, the UK continues to seek derogations for its existing coal-fired plants in the current negotiations of the revision of the IPPC and LCP Directives into the new Industrial Emissions directive. Again, these are being justified in terms of a limited remaining life, albeit one that exceeds not only the initial 2010 'closure' date, but also the later 2015 maximum time period taken into consideration in the determining of their IPPC permits.

In fact, since the UK plants started evading SCR, they have already had a continued life long enough to cover the 15 year period needed to amortise the debt of fitting SCR. But still they plead limited remaining life, poverty, prospective energy gaps etc, and the UK Government supports them in doing so.

And it is this that underlies the UK's appalling performance in the EU-27's tables of the largest point sources of NOx emissions.

Lesley James,
Friends of the Earth
(England, Wales & N. Ireland)

1) The very few plants burning low volatility coal within the EU have a derogation under the LCP Directive delaying the requirement to fit SCR until 31st December 2017.

2) The study was based on a full cost benefit analysis. However, the Economic and Cross Media BREF states that this methodology should not be used for BAT assessments because of the problems of costing ecological damage – CBA studies therefore overemphasise the costs of fitting a technology. The ECM BREF states that instead, a simple cost effectiveness study should be undertaken, giving a cost/tonne of pollutant abated.

British power plants pollute Dutch rural areas

Three big British power plants contribute more to the depostion of sulphur, nitrogen oxides and fine particles in rural Holland than 11 domestic plants combined.

Three large British power plants contribute more to nitrogen and acid deposition and particulate matter ($PM_{2.5}$) levels in most rural areas of the Netherlands than eleven large Dutch power plants combined, according to the findings of a recent study.

At the request of the Netherlands Society for Nature and Environment (Stichting Natuur en Milieu, SNM), the Dutch institute TNO has calculated to what extent three large UK power plants contribute to acidification and eutrophication in nature reserves and to levels of fine particles in rural areas in the Netherlands. Their contribution is compared to the collective contribution of eleven large Dutch power plants, which produce half of the electricity used in the Netherlands.

JINHAI ZHANG/FOTOLIA

Blame it on the Brits.

The contribution of the Drax power plant (located in Selby, Yorkshire) alone is about 50 per cent compared to the eleven Dutch power plants combined. This also holds true for Kingsnorth in Kent in the south-east of England. The third power plant, Aberthaw (which is situated further away, near Cardiff in Wales) contributes less – but still substantially – to PM concentrations and deposition.

Despite their large distance from the Netherlands, the three UK power plants jointly contribute more to PM concentrations and depositions in most of the rural areas of the Netherlands than the eleven large Dutch power stations combined. In the northern half of the country depositions from the three UK plants in fact equate to almost twice the contribution of the eleven Dutch plants.

In contrast to the Dutch power plants, these UK power plants do not apply the best available techniques (BAT) for reducing emissions of air pollutants. The study shows that this not only has a negative effect on the air quality in the UK itself, but also in the neighbouring Netherlands. It is concluded that applying BAT to these plants would be an effective way of reducing pollution levels in the Netherlands.

SNM therefore stresses the need for EU legislation that puts an end to the unjustified differences in permitting practices in the various EU countries, and states that the possibilities to derogate from strict application of BAT should be as restricted as possible.

Sijas Akkerman from SNM stated: "The derogations from the BAT approach in the UK not only have a detrimental effect on the environment, but also harm and distort the level playing field across the EU – the burden to clean up unnecessary pollution produced in the UK is shifted to the Dutch industry".

In July the European Parliament will vote on the amendments in a second reading of the new Industrial Emissions Directive. Environmental groups are demanding that loopholes, such as the "transitional national plan" and "limited life time derogation" should be removed from the directive, since they will allow the above UK power plants, and many other large polluters, to continue avoiding the implementation of BAT.

Christer Ågren

[1] The report **"Contribution of power plant emissions in the UK and the Netherlands to air quality and depositions in the Netherlands"** can be downloaded from: *www.natuurenmilieu.nl/page.php?pageID=89*

Table: Estimated emissions of air pollutants in 2005 (tonnes).

	SO_2	NOx	PM_{10}	$PM_{2.5}$	NH_3	VOCs	CO
11 Dutch power plants combined	4,900	26,800	170	130	54	390	6,300
Drax	22,600	61,400	1,420	730	5	510	5,200
Kingsnorth	31,300	21,700	720	370	3	260	2,600
Aberthaw	28,300	25,900	540	280	2	190	2,000

North American ship pollution will be curbed

The emission control area off North American coasts will deliver public health benefits hundreds of miles inland.

On 26 March the International Maritime Organization (IMO) officially designated waters off North American coasts as an Emission Control Area (ECA) in which stringent international emission standards will apply to ships. These standards will dramatically reduce air pollution from ships and deliver substantial air quality and public health benefits that extend hundreds of miles inland.

The ECA extends up to 200 nautical miles (370 kilometres) from the coast of the United States and Canada. This is the first ECA adopted under amendments to an IMO treaty in 2008 that strengthened and expanded both the ECA emissions standards and the approval criteria *(see Acid News No. 2, 2009)*.

Entry into force for the new ECA will be 1 August 2011, which means that the stricter sulphur emission limits take effect from 1 August 2012.

In practice, implementation of the ECA means that ships entering the designated area would need to use compliant fuel[1] for the duration of their voyage that is within that area, including time in port as well as voyages whose routes pass through the area without calling at a port. The quality of fuel that complies with the ECA standard will change over time. From the effective date in 2012, fuel used by all vessels operating in designated areas cannot exceed 1.0 per cent sulphur (10,000 parts per million). Beginning in 2015, fuel used by vessels operating in these areas cannot exceed 0.1 per cent sulphur (1,000 ppm). Beginning in 2016, new ships must use advanced emission control technologies to reduce NOx emissions.

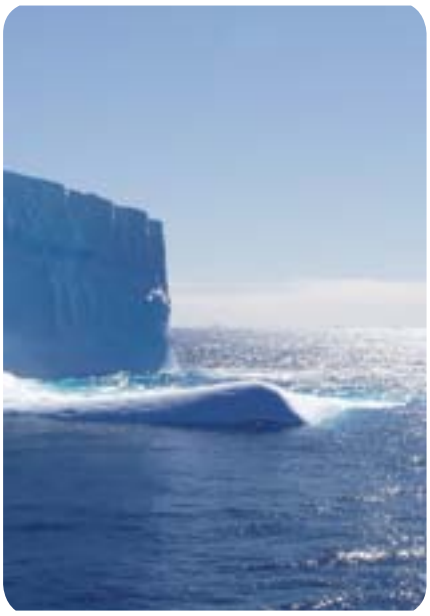
Enforcing the ECA standards will ultimately reduce the sulphur content of fuel by 98 per cent, particulate matter (PM) emissions by 85 per cent and emissions of nitrogen oxides (NOx) by 80 per cent.

In 2020, the US Environment Protection Agency (EPA) expects emissions from ships operating in the designated area to be reduced by 320,000 tons for NOx, 90,000 tons for $PM_{2.5}$, and 920,000 tons for SO_2, which is 23 per cent, 74 per cent, and 86 per cent, respectively, below predicted levels in 2020 without applying the ECA.

The overall cost of the North American ECA is estimated at US$3.2 billion in 2020, while its benefits are expected to include preventing as many as 14,000 premature deaths and relieving respiratory symptoms for nearly five million people each year in the US and Canada. The monetized health-related benefits are estimated to be as much as US$110 billion in the US in 2020.

1) According to IMO standards, exhaust-gas cleaning systems (e.g. scrubbers) that achieve equivalent sulphur emission reductions may be used as an alternative to low-sulphur fuels.

More information: *www.epa.gov/otaq/oceanvessels.htm*



JAN WILLS / FOTOLIA

No country for heavy grade oils.

Heavy fuel oil banned in the Antarctic

An International Maritime Organization (IMO) ban on the carriage of heavy grade oils as cargo or fuel in the Antarctic area was adopted at a meeting of the IMO's Marine Environment Protection Committee (MEPC) in March and will come into effect on 1 August 2011. The decision bans the carriage or use of crude oils and other types of heavy oils having a density at 15°C higher than 900 kg/m^3, as well as the carriage of bitumen, tar and their emulsions.

Source: Sustainable Shipping News, 26 March 2010.

IMO expert group on shipping GHG emissions

The International Maritime Organisation's (IMO) environment policy decision-making body agreed in March to set up an expert group that will assess the feasibility of market-based measures for reducing ship's greenhouse gas emissions. The expert group will make recommendations at the next meeting of the IMO's marine environment protection committee (MEPC) in September.

Another working group is looking at options to improve ships' energy efficiency. The committee prepared a draft text on mandatory requirements for an energy efficiency index for new ships and an energy efficiency management plan for all ships.

Source: ENDS Europe Daily, 29 March 2010

A WWF prescription for greening Germany

German greenhouse gas emissions can be cut by 95 per cent by 2050 without excessive costs, a new WWF report claims.

WWF in Germany has commissioned a report on how to cut German greenhouse gas emissions by 95 per cent by the year 2050 and 41 per cent by 2020 in an affordable way. The results are striking, not least because Germany is a relatively difficult country to transform.

The 'Blueprint Germany' report was prepared by Prognos, Öko-Institut and Dr. Ziesing on behalf of WWF and published late 2009.

The target is a 95-per-cent reduction by 2050 from 1990, with a 41-per-cent cut by 2020. This is in its turn deduced from the 2 degrees target. Table 1 shows targets for an innovation scenario, compared with a reference scenario, which roughly represents German official goals and policy. The Blueprint scenario is almost the same as the innovation scenario until 2040, but is more demanding for 2050.

The 533-page report[1] is not easy to grasp, but there is a summary in English. The main message is that in order to achieve the final 2050 goal (call it sustainability), deep cuts have to be made by 2020. The year 2020 is also much more important from a political and diplomatic perspective.

The WWF study keeps carbon capture and storage (CCS) as a limited option open for a more distant future, but assumes that it will not cut any CO_2 by 2020.

Redecorated by WWF Germany.

There are two fundamentally different ways of making scenarios. One is the top-down approach, which uses macroeconomic entities with input from historical econometrics. The other, which the WWF study uses, is the bottom-up approach, which collates trends in the energy use of fridges, lamps, electricity generators, cars etc. Those so inclined can find a wealth of information here.

Table 2 shows what technology can achieve with a certain amount of organisation and political will.

Germany has a number of disadvantages compared to much of the world. It is densely populated, which means limited space for growing biomass. It has limited hydropower resources. Solar resource are also limited. Germany is a world leader in wind power with approx. 40 TWh/year, but much of Germany is not very windy, the room for expansion onshore is limited, and this figure rises to no more than 67 TWh by 2050 in the innovation scenario. With a modern industry and an aging population, new construction will not amount to much. Brand new super-efficient buildings, and pulling down old inefficient buildings will not be less of a solution than in say China and the USA.

So if it can be done in Germany, it can be done next to anywhere.

The WWF study does not take the easy way out. Nuclear power is phased out in the 2020s – as indeed looks increasingly likely, with the CDU Minister of Environment Norbert Röttgen sticking to the nuclear phaseout of the previous governments. Carbon capture is not credited much, not at all in some scenarios. And there is no rapid phase-out of coal and lignite for electricity. Coal power is not completely eliminated until after 2040.

The framework of assumptions implies no austerity. GDP grows by about a third from 2005 to 2050, while the population decreases from 82 to 72 million. Passenger transport remains the same, and the living space increases moderately, both as per capita. The structural change is undramatic: industry grows 20 per cent, while

1) English summary at *www.wwf.de/fileadmin/fm-wwf/pdf_neu/blueprint_germany_wwf.pdf*

Full report in German at *www.wwf.de/fileadmin/fm-wwf/pdf_neu/WWF_Modell_Deutschland_Endbericht.pdf*

the services sector grows 46 per cent. The price of oil increases from $54 per barrel in 2005 to 100 in 2020, and 210 in 2050. Obviously a high oil price assumption makes it easier to cut emissions, but the spot price is now about $85.

So how do they do it? Technology is a big part, for example:

- New materials: energy efficient materials, which avoid metals in buildings and cars.
- High-performance thermal insulation, which can be easily and extensively used in existing buildings.
- Reactive window coatings that enable considerable savings in room heating in winter, and reductions in radiation exposure in summer.
- New building materials based on plastic and composite materials.
- Process optimisation and optimisation of building management.
- Organic solar cells.
- Grid optimisation and demand side management to balance out peak loads.

About half the cut for 2020 comes from efficiency gains: efficient buildings, electricity appliances and in industry.

Another 30 per cent comes from more renewables. Onshore[2] wind energy reaches its maximum, 100 TWh by 2020 (27 TWh in 2005, about 40 presently), but offshore wind at about 40 TWh in 2020 continues to grow later. Photovoltaics increase to about 15 TWh by 2020 (6.2 TWh in 2009), and increase slowly after that. Electricity from biomass increases from 12 TWh in 2005 (no data for 2009) to some 45 TWh in 2020, and then declines.

The remaining 20 per cent comes from diverse measures to reduce non-CO_2 greenhouses gases in industry and agriculture, from the coal-to-gas fuel shift etc.

No importing of electricity is assumed by 2020, but later cuts imply electricity imports to a maximum of 48 TWh.

By 2020, electricity consumption is cut by 17 per cent and by 2050 it is cut by 35 per cent.

The emissions cut is mainly from oil and gas heating for all buildings, through improved efficiency and more solar heating and heat pumps. The use of less lignite for power also contributes, though hard coal use is projected to grow by 2020, and decrease only later. This is because the increasing share of intermittent renewables creates a need for more energy storage and balancing. The actual storage options are limited in the mid-term perspective, but existing hydro pumping stations can be used more. Balancing can, so far, be achieved through the import/export of electricity and by using gas power stations more for peak and reserve supply. Demand side flexibility will also have to be exploited much more by using innovative technology and by more efficient markets and price signals to shift the use of electricity by a split second, a few hours or – very seldom – a week.

Biomass electricity has no intermittency problem, but biomass is needed even more for vehicle fuels, so biomass electricity is projected to first grow, and then decline.

The biomass balance is one of the critical factors in the long-term scenarios, so the study recommends strong sustainability criteria for any imported biomass.

In the transport sector, the emissions cut (15 per cent from 2005 to 2020) is achieved through improved efficiency and by second-generation bio-diesel. In the longer term hybrid and electric vehicles will take over.

It takes a lot of policy to achieve the targeted cuts. For example:

- Stricter new building standards with a maximum annual energy consumption value for space heating of 20 kWh per m^2 effective from 2015, of 10 kWh per m^2 starting 2020 and the zero-energy or plus-energy house standard from 2025 onwards.
- Consistently strict consumption limits for all electric appliances according to the top-runner principle (consumption values of the best appliances as minimum standards to be achieved by the next generation of appliances within five years).

One problem with the WWF scenario, and most other scenarios, is that it postulates a smooth gradual transition without lifestyle changes. This is not the way the world works. Think of the oil crises in the 1970s, of the collapse of the Soviet Union with the subsequent 40 per cent plunge in CO_2 emissions in the whole

Continued on following page ▶

	2005	2020	2030	2040	2050
Reference scenario	-14	-26	-35	-40	-45
Innovation scenario	-14	-41	-63	-77	-87
Blueprint scenario		-41	-63	-80	-95

Table 1: Reduction of German GHG emissions from 1990 (per cent)

2) Derived from graph 5.3-37 in the full report.

	2005	2020	2030	2050
Nuclear	151	30	0	0
Hard coal	128	129	68	0
Lignite	152	86	50	0
Natural gas	67	49	47	12
Oil and other	18	0	0	0
Storage	7	16	24	55
Hydro	20	24	25	25
Wind onshore	27	54	58	67
Wind offshore	0	34	84	142
Photovoltaics	1	16	22	28
Biomass	12	46	45	41
Geothermal	0	2	6	36
Sum	583	485	428	405

Table 2: Net power supply in TWh, innovation scenario without CCS.

Greening Germany

Continued from previous page

eastern bloc. And think of the coming oil production peak.

The WWF finds that it takes more than technology and no-regret to achieve a 95-per-cent cut by 2050, so they add biomass CCS, and CCS as a way to cut process emissions from for example pig-iron production, and increase the use of biofuel in aviation.

The latter will add to the biomass constraint. Another way to deal with the problem would be a minor decrease in transport, which in fact took place almost everywhere in 2009.

As for biomass CCS, its economics are questionable to say the least, as is the notion that pig-iron based on ore and coal is viable for another 40 years.

The German Blueprint has included land use change (LULUCF), which actually makes the exercise even harder, as deforestation is assumed to slightly exceed afforestation. Excluding LULUCF, the 95-per-cent cut is actually 96 per cent.

Now that the WWF has produced a credible long-term vision, it should produce a new summary focusing on 2020, with fewer graphs and more tables, so as to make the results more accessible and transparent.

Fredrik Lundberg

EU Parliament votes for stronger pollution directive

On 4 May the European Parliament's environment committee agreed to somewhat strengthen proposals to revise the EU directive on industrial pollution (IPPC). It called for stricter derogations from certain requirements than were agreed by the Council in June last year *(see AN 3/09, pp. 20–21)*. Some members of parliament (MEPs) joined forces with environmental organisations in concluding that the demands were not ambitious enough.

INOCHKA / FOTOLIA

Only BAT is good enough for the EU Parliament.

The Parliament's rapporteur, German liberal Holger Krahmer, said the compromise reached by committee members was a good start for negotiations with the Council of Ministers. The parliament's full assembly will vote on the proposals in July.

Among other things, stricter conditions for deviating from best available techniques (BAT) were agreed, meaning that operators of IPPC installations would only be able to deviate from BAT in specific cases, provided certain conditions are met.

Regarding transitional plans, MEPs said certain large combustion plants (LCPs) should be given until June 2019 to comply with NOx and SO_2 limits, while the Council wants a December 2020 deadline.

MEPs also agreed that the proposed limited lifetime derogation should only be granted to LCPs not operating for more than 12,500 hours in total, compared with 20,000 hours as proposed by Council.

The committee agreed to include a provision allowing member states to set limits for emissions of CO_2 for all sorts of industrial plants if they want to – a measure strongly supported by environmental organisations. Mr Krahmer says this conflicts with emissions trading legislation, and it is expected that the Council will try to remove it in their second reading position.

Sources: ENDS Europe Daily and press release by the European Environmental Bureau (EEB) 4 May 2010.

Breaches of emission ceilings expected

Around half of the EU member states expect to miss one or more of the 2010 legal limits for air pollutant emissions set by the national emission ceilings (NEC) directive. According to recent data compiled by the European Environment Agency (EEA), eleven countries expect to exceed their ceilings by significant amounts – some missing NOx targets by more than 40 per cent.

Austria, Belgium, France, Ireland, Luxembourg, Malta and Spain are expected to exceed their national NOx ceilings by more than 10 per cent. The others, namely Germany, Slovenia, Sweden and the UK, are likely to exceed their ceilings by less than 10 per cent.

According to the EEA, this is partly because the road transport sector, which contributed around 40 per cent of total EU NOx emissions in 2008, has grown more than expected and partly because vehicle emission standards have not always delivered the foreseen level of NOx reductions.

The NECs for non-methane volatile organic compounds (VOCs) are expected to be exceeded by three countries: Spain, Portugal and Austria, and those for ammonia emissions also by three countries – the Netherlands, Germany and Spain.

The European Commission has not yet tabled its long overdue proposal to revise the NEC directive and tighten the NECs for 2020. Revision of the NEC directive is key to achieving the EU's health and environmental objectives. In the absence of new legislation, the current NEC directive remains in force and requires that future emissions stay below national ceilings after 2010. *(See also Acid News 4/2009, pages 4–5.)*

Source: EEA press release, 4 May 2010

STEPHEN COBURN/FOTOLIA

Go slower to go greener

The overcapacity in the cargo fleet creates an opportunity to reduce ship emissions by simply sailing slower.

Current overcapacity in the ship fleet presents a golden opportunity for the global shipping industry to make quick and substantial reductions in emissions.

A new report[1] assessing the potential of the shipping industry to cut its emissions of the main greenhouse gas (GHG) carbon dioxide has concluded that if the main shipping sectors make full use of existing fleet overcapacity they could reduce emissions by as much as a third, or up to 255 million tons per year, over the next three years.

Sailing at slower speeds improves operational efficiency and reduces fuel consumption. According to the study, a 10 per cent reduction in ships' speed corresponds to a drop in fuel use – and an accompanying drop in fuel-related emissions, such as carbon dioxide and sulphur dioxide – of approximately 27 per cent per unit of time, or 19 per cent per unit of distance. In reality, the emissions reductions will be higher than 19 per cent, as ships sail only a part of their time at their optimal speed.

If you slow ships down you need more ships to move the same amount of cargo in a given time and this has been one of the arguments used against reducing the speed of ships. However, the study shows that for the most important fleet segments – tankers, bulk carriers and container ships – the recent economic downturn has resulted in sufficient overcapacity in the fleet to cut emissions by around 30 per cent by slow steaming. Moreover, the study assumes levels of speed reduction that are consistent with the safe and reliable operation of ship engines and that do not require the retrofitting of new equipment.

The overcapacity in the world fleet can be addressed in several ways. One is to decrease the amount of cargo carried per ship, another is to idle ships, and a third is to sail at lower speeds. The latter option has the advantage that fuel is saved and emissions are reduced.

"In short, this study shows that the current overcapacity in the fleet presents the global shipping industry with a golden opportunity to make substantial reductions in emissions in the short term," said John Maggs, Policy Advisor with Seas At Risk, "This is particularly important given the urgent need to peak greenhouse gas emissions in the next few years if global warming is to be kept well below two degrees and catastrophic consequences avoided."

Consequently, speed reduction is an important part of the package of measures that will be necessary if the shipping industry is to make a proper contribution to the very large cuts in emissions that are necessary to avoid runaway climate change.

The launch of the study coincides with ongoing deliberations in the International Maritime Organisation (IMO) concerning the technical, operational and market-based approaches to tackle GHG emissions from shipping.

Christer Ågren

[1] The study, entitled "**Going Slow to Reduce Emissions**" was commissioned by Seas At Risk, undertaken by the Dutch consultancy C.E. Delft. Available from www.seas-at-risk.org.

40 per cent carbon cuts with smaller scale tech

Greenhouse gas emissions can be cut by 40 per cent in ten years - with no nuclear power and without carbon capture, a new study from the Stockholm Environment Institute claims.

The "40 per cent study" by the Stockholm Environment Institute[1] for Friends of the Earth Europe (FoE) shows that it is possible to cut greenhouse gases emissions from the EU-27 by 40 per cent by the year 2020 and 90 per cent by 2050 with slightly lower economic growth – with no nuclear power and no carbon capture. Some lifestyle changes are implied: less meat, less flying, and more leisure time.

STOCKSNAPPER / FOTOLIA

Part of the solution.

The 40 per cent study cuts most of the emissions in three sectors: electricity, heat, and transport.

Electricity demand is projected to grow fairly rapidly first, and then fall back to 2,800 TWh by 2050, a lot less than the 4,800 TWh in the ECF scenarios *(se pages 6-7)*. The uphill part is motivated by fast electrification to squeeze out fossil fuels for heating.

Carbon capture and sequestration (CCS) is on the whole dismissed, along with nuclear power, as it is "unproven whether it can be commercialised rapidly enough given the urgency of phasing out existing fossil fuel plants. A more general concern is that the promise of CCS could lead to a new generation of so-called 'CCS ready' coal-fired power plants which once built will lock society into carbon-intensive power generation."

As in many scenarios, wind power grows aggressively from some 4.2 per cent of EU electricity today[2] to 22 per cent in 2020 and 55 per cent in 2050. Intermittency is managed by localized energy storage for on-shore wind power. One method is compressed air energy storage, in conjunction with some natural gas for peaks, in the same turbines.

Electric vehicles can, according to FoE, also balance wind power in two ways: they can be charged during off-peak hours, and serve as extra capacity when not used. The cost for wind power with storage can be competitive to coal power with CCS, according to the study. There may be other storage options, such as flywheels, it adds.

The advantage of local storage is that it minimizes the need for new power lines, which are not only expensive but also take a long time to build, assuming a reasonable democratic planning process.

Demand side management (DSM) is also explored:

"New electrical devices and facilities which can be switched down or off when supplies are short also have a large potential to help balance short-term slews in the demand for electricity. Refrigeration, air conditioning, wet appliances and ground source heat pumps are all good candidates for advanced technology centrally controlled DSM and could contribute to significant load levelling."

The FoE scenario takes 15 per cent of its electricity by 2050 from solar power, both concentrating solar power, some of which is imported from the Sahara, and photovoltaics. Minor contributions are expected from geothermal, wave and tidal power.

As for wind power, "the decade requiring the fastest rate of addition of wind power is 2020–2030 during which time, new wind power is required to be built at a rate of 25 GW/year across all of Europe". This may sound a lot, but in fact more than 10 GW was added in 2009, so nobody can say it is not feasible.

One of the more striking features of the FoE study is how it projects transport. Car transport is to be reduced in absolute terms. Road transport is to fall a few per cent by 2020 and almost by half by 2050. This is not a large reduction per year, about 1.5 per cent per year on average, but a radical departure from the development we have seen for several decades. Air travel within Europe will follow similar lines. Travel will remain fairly constant, however, because train and bus transport will grow

Part of the solution.

FLEMISH DREAMS / FOTOLIA

1) Full study: *www.sei-international.org/mediamanager/Documents/Publications/Climate-mitigation-adaptions/europes_share_heaps_09.pdf*, summary *www.FOEeurope.org/climate/FOEE_SEI_40_study_summary_Dec09.pdf*

2) Eurostat provisional data for 2009

fast. This calls for "a large expansion of the rail network" – more than double the current infrastructure by 2050.

The virtual elimination of emissions from households (from present oil, gas and coal heating) means "an aggressive effort to retrofit housing" to near passive house standards.

Biomass use increases from about 5 exajoules per year to 7 in 2020, but then falls back to 5 exajoules in 2050. Present biofuels (ethanol and rapeseed oil) in transport are given short shrift, though biomass will be used much more widely for combined heat and electricity, until wind and solar overtake it.

Emissions from agriculture are about a tenth of the total now, but have fallen from 579 Mtons CO_2-equivalents in 1990 to about 482 today. The reduction so far is not the result of climate policy, but the result of shrinking agriculture. FoE projects that emissions will fall to 363 by 2020 and 213 by 2050, though quite different routes, the first being technical solutions such as changes in fertilizer and livestock practices within Europe, and secondly: "a less meat-intensive diet in Europe would contribute to reduced GHG emissions and allow people to be healthier. The mitigation scenario assumes that by 2020 the average European has switched to a diet which is approximately 60 per cent less meat-intensive than today. This healthier level of meat consumption would result in reduced direct methane and N_2O emissions from livestock and lower N_2O emissions from fertilizing crops for animal feed inside and outside Europe." Less cattle, and less land used for growing feed crops, would free up large quantities of land "to growing biomass crops or use for carbon sequestration".

FoE does not, unfortunately, describe how to achieve this meat reduction, but if it can be done in Europe, through information campaigns, taxation, changing menus in school restaurants or whatever it can contribute to solving several pressing global problems.

	1990	2020	2050
Total	4,786	2,808	549
Electricity and heat production	1,670	760	104
Energy demand	2,404	1,650	259
- of which transport	915	902	159
- of which households	657	332	4

Table: Major emissions development in the mitigation scenario (million tons CO_2).

The future projected by FoE also includes an element of dematerialized growth: "While average levels of material consumption would be roughly the same as today (but significantly higher for those residing in the new member states), health care, local leisure opportunities, and other less materials-intensive services would be substantially better for all."

This may not be a vision shared by everybody, but it makes a good point: Climate policy does not spell the death of politics. The choices are not only about technology but also what kind of society we want.

DJAPENER / FOTOLIA

Part of the solution.

One problem with the FoE study is that the baseline scenario used as backdrop gives about the same emissions in 2050 as in 1990. This is an unfair representation of European climate politics, inadequate though it is. Not only that. The exponential "more of the same" growth may not be only be unwanted, it may also be impossible, once the oil crunch hits us.

A more interesting comparison is provided by the ECF scenarios.

FoE makes a good effort to show that greenhouse cuts are not only about technological fixes. Highly centralized, large-scale solutions in which everybody moves faster are not the only way. But after all it is not all that radical. In the FoE scenario, cement production emissions remain unchanged by 2020 and fall from that level, about 122 Mton, to 75 Mton in 2050.

The reason for using so much cement is that "cement is essential for constructing the transportation infrastructure and buildings that are called for in the mitigation scenario". The decrease between 2020 and 2050 is dependent on cement substitution for waste products such as slag but also to some extent new "green" cements that do not emit carbon and in some cases actually absorb CO_2 over their lifetime. (The much hyped British innovative Novacem claims to achieve this, by substituting calcium-based cement for magnesium-based cement.) It may be wise, as FoE does, not to credit a yet-to-be-developed technology too much. But on the other hand, over a 40 year period it is surely possible to achieve less bulky methods to construct buildings, railways and wind power stations than with Portland cement.

Everything is not small scale in the FoE scenario. It allows for some imports of solar electricity from the Sahara, but not for a "North-grid" connection of huge amounts of North Sea offshore wind-power, balanced by Scandinavian hydro, between the UK, Ireland, Norway and the continent, though this now looks more realistic for the near term.

Fredrik Lundberg

Clean Shipping Coalition launched

A new international environmental coalition dedicated exclusively to the greening of international shipping was launched in April. The Clean Shipping Coalition (CSC) will promote policies aimed at the protection and restoration of the marine and atmospheric environment. The eight founding members, which include AirClim and Transport & Environment, are all experienced in sustainable transportation and marine environment issues as well as the operation of international regulatory bodies like the International Maritime Organisation, where the coalition has recently applied for consultative status.

Web link: www.cleanshipping.org

Filter removes 80 per cent of particles

Mitsui O.S.K. Lines (MOL) has announced the joint development with Akasaka Diesels of a diesel particulate filter (DPF) for vessels using marine heavy fuel oil. The device is said to be capable of removing more than 80 per cent of particulate matter (PM) from diesel emissions. In the test, the DPF was installed on the main engine of a coastal ferry with a 9,300 kW main engine. Mitsui says this test marked the first successful use of a self-regenerating DPF on a large vessel using marine heavy fuel oil.

Source: AECC Newsletter, March-April 2010. Web link: www.aeec.eu

Website on onshore power launched

A new international website – developed under the lead of the Port of Gothenburg – offers practical and useful information and calculation tools about onshore power supply (OPS) for seagoing vessels as a measure to improve air quality in and around ports, lowering emissions of carbon dioxide and reducing noise. It is specifically aimed at encouraging ports, terminal operators and shipping lines worldwide to implement OPS technology.

Web links: www.ops.wpci.nl and www.onshorepowersupply.org

Too much NOx from trucks

A recent research project by the Dutch consultancy TNO has shown that real world NOx emissions from Euro V trucks in urban driving conditions are three times higher than previously expected and only marginally better than those of Euro III trucks, although the type approval limit value is 60 per cent lower *(see figure)*. The Euro III emission standards were introduced in 2001, followed by Euro IV in 2006 and Euro V as from October 2008.

Most of the measurements involved trucks with selective catalytic reduction (SCR) after-treatment technology. So far only one Euro V truck with exhaust gas recirculation (EGR) technology has been tested. This truck also showed increased NOx emissions at lower speeds, but to a much lesser extent than the SCR equipped trucks.

In a letter to the three EU Commissioners for environment, industry and transport, Dutch officials express concern that this will make it harder to meet EU targets for nature conservation and health protection. It may also complicate member states' ability to meet national emission ceilings for NOx and air quality limit values.

Rules for implementing EU vehicle emissions standards are being developed under comitology. The Euro standards are set on the basis of laboratory tests, and while these now appear to correspond reasonably well to conditions for motorway driving, they obviously do not match when driving in urban conditions.

In the letter the Dutch suggest that the European Commission should negotiate an agreement with lorry manufacturers to modify the calibration software of Euro V vehicles to better reflect actual driving conditions and to ensure lower emissions.

Regarding the forthcoming Euro VI standards, that will apply as from 2013, the Dutch suggestion is to require the use of portable measurement systems (PMS) to ensure in-service compliance.

According to Jos Dings, director of the green group Transport & Environment (T&E), the Dutch proposals are the best solution given the Euro V standards are already set in law and the vehicle type approval system cannot be changed because the EU is in transition from a European to an international system.

Christer Ågren

Sources: On-road NOx emissions of Euro-V trucks (December 2009), TNO report MON-RPT-033-DTS-2009-03840; Letter from the Dutch Ministry of Environment to Environment Commissioner Potocnik (February 2010); ENDS Europe Daily, 10 March 2010.

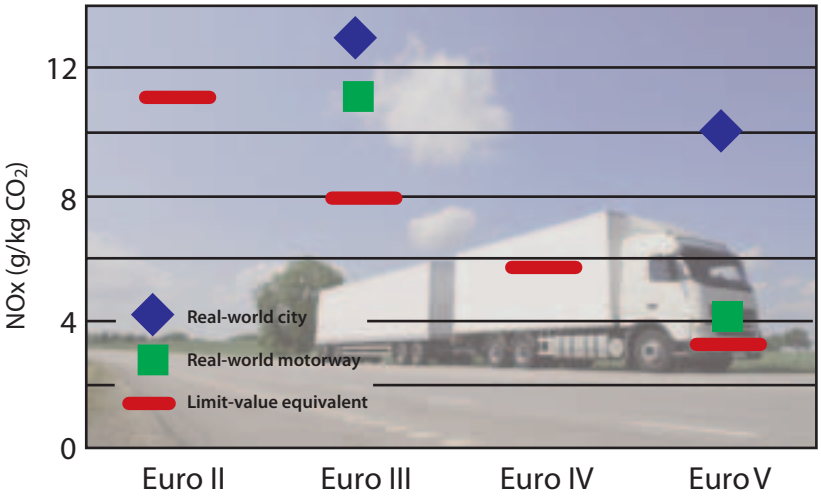


Figure: Comparison between real-world NOx emissions and emission limit value equivalents for heavy duty vehicles of various Euro classes. Source: Dutch letter to EU commissioners (February 2010)

Fate of the boreal forest - regional perspectives

Earth's boreal forest of has a large impact on the global climate through its effect on radiation and carbon balance. Massive die-back of boreal forest in response to global warming has been pointed out as one of the possible "tipping elements" that may cause runaway warming.

However, when looking at interactions between climate and the boreal forest, there are fundamental regional differences that have to be taken into account, according to a new report[1] from the AirClim Secretariat.

There are mainly two reasons for the regional differences discussed in the report.

Firstly, all climate projections show that the temperature increase will vary widely over the Arctic region. If global mean warming can be kept at 2°C, some northern parts of the boreal forest zone will experience 3-4°C warming, while Scandinavia and western Russia will stay at about the global mean. Under 4°C-scenarios, some parts of the boreal forest are likely to suffer from a temperature increase of 8-10 °C by the end of this century, while warming will stay at 6°C in parts of Scandinavia.

The second factor of importance is the fundamental difference between primary and managed forests. In Siberia and northern Canada most of the boreal forest is still in a natural state, which means that natural disturbances - primarily fire and pests - are the most important factors in forest dynamics. In a warmer climate, disturbances are expected to increase considerably in frequency and areas affected. In fact, increased fire frequency may already have caused Canada´s boreal forest to shift from a carbon sink to a source.

In Scandinavia and European Russia most forests are managed, which means that the potential for mitigating unwanted climate effects may be far bigger than in northern Canada or Siberia.

1) Boreal Forest and Climate Change - Regional Perspectives. AirClim report #25.

All-time low in European ozone levels

Ozone levels in Europe during summer 2009 were among the lowest since comprehensive data reporting started in 1997. Eighteen EU countries reported exceeding the information threshold (ozone concentrations over 180 µg/m^3), with Belgium, Greece, Italy and Portugal recording the largest number of exceedances.

The record lows in 2009 came despite average summer temperatures close to those measured in the extremely hot summer of 2003, which witnessed the highest number of exceedances in the last decade. The differing results in the two summers may be attributable to several factors because ozone formation is determined by various meteorological conditions, as well as the chemical composition of the atmosphere. It seems likely, however, that reductions in man-made ozone precursor pollutant emissions in Europe contributed significantly to the general decrease in peak ozone concentrations.

Source: EEA report "Air pollution by ozone across Europe during summer 2009" (3 March, 2010). Web link: *www.eea.europa.eu/publications/*

Higher fuel bills will cut ship emissions

Higher bunker fuel bills will act as a driver to cut ship emissions, as efficiency gains when bunker prices are high result in substantial cost savings for shipowners. The greater the gains in efficiency, the lower a ship's fuel consumption, and the lower its emissions.

New global regulations on fuel sulphur content will push increased consumption of low-sulphur distillate fuels. Sulphur emission control areas (SOx-ECAs) are already in place in northern Europe (the Baltic Sea and the North Sea) and will soon be so in North America (up to 200 nautical miles from the coast). SOx-ECA requires fuel below 1.00% sulphur from July 2010 (in North America from August 2012) and below 0.10% from January 2015. The global fuel sulphur limit is currently 4.50%, to be lowered to 3.50% from 2012 and further to 0.50% as from 2020.

The 0.10% sulphur limit can only be attained by switching to cleaner distillate fuel, such as marine gas oil. In the first quarter of 2010 the price for marine gas oil was about US$600/tonne – about US$200 more expensive than heavy bunker fuel oil. But as oil prices have crept higher, early April saw distillate prices rise to over US$700/tonne.

For shipping, improving efficiency and reducing fuel consumption is therefore a win-win situation, resulting in less emissions of air pollutants and greenhouse gases as well as lower fuel bills.

Source: Sustainable Shipping News, 19 April 2010

Final warning for missing permits

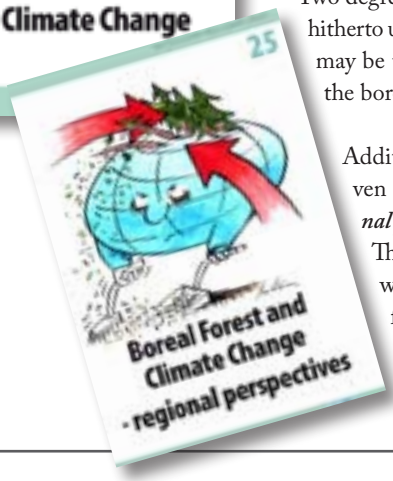
In March the European Commission sent final warnings to Austria and Sweden about some 70 industrial installations that are either operating without permits or with permits that are now out of date. Fifty of these plants are in Sweden, and 21 in Austria. Under European law, the permits should have been issued by 30 October 2007. Permits are only issued if a number of environmental criteria are met.

Source: Commission press release 18 March. Web link: *europa.eu/rapid/*

Recent publications from the Secretariat

Market-based instruments for NOx abatement in the Baltic Sea

By Per Kågeson, November 2009. This report assesses potential market-based instruments for reducing emissions from existing vessels and an early introduction of efficient NOx abatement technologies for newly built ships.
A rough calculation of the emission reduction potential indicates that application of an emissions charge, as outlined in the report, could cut NOx emissions from ships in the Baltic Sea by around 60 per cent.

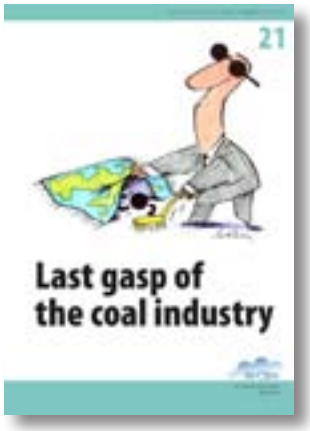


Boreal Forest and Climate Change

By Roger Olsson, November 2009. Reviews recent scientific findings on the fate of the world´s boreal forests under climate change. The effects of climate change are already evident in all parts of the boreal forest, and change will be far more dramatic as temperature continues to increase.

Two degrees of warming may trigger the creation of new, hitherto unseen ecosystems. Three to five degrees warming may be the critical limit for massive forest die-back in the boreal region.

Additional, regional perspectives on the topic is given in *"Boreal Forest and Climate Change - regional perspectives"* (by the same author, April 2010). The expected rate of warming varies considerably within the Arctic region, as does the state of the forest. This means that the possible climate effects - and the possibilites to mitigate them - will be different.



Last Gasp of the Coal Industry

By Gabriela von Goerne and Fredrik Lundberg, October 2008.

By employing carbon capture and storage (CCS) we can continue to use fossil fuels and at the same time greatly reduce carbon dioxide emissions. This frequently painted picture sounds almost too good to be true, and that is probably the case.

This report takes a look behind the bright vision of CCS given by proponents of this technology. It is not intended to damn CCS but is an appeal for wise decision-making.

How to order

Single copies of the printed publications can be obtained from the Secretariat (free of charge within Europe). Please call for quotation if more copies are required. Reports can also be downloaded in pdf format from www.airclim.org

Coming events

Synergies and trade-offs between climate and air pollution policies: Optimizing opportunities and preventing risks. Utrecht, the Netherlands, 18 June 2010. Information: *www.pbl.nl/eng*

EU Environment Council. 21 June, 2010. Information: *www.consilium.europa.eu/*

Air Pollution 2010: 18th International Conference on Modelling, Monitoring and Management of Air Pollution. Kos, Greece 21-23 June 2010. Information: *www.wessex.ac.uk*

Towards Carfree Cities Conference IX. York, UK, 28 June - 1 July 2010. Information: *www.worldcarfree.net/conference/*

Cities for Mobility World Congress 2010. Stuttgart, Germany, 4-6 July 2010. Information: *www.cities-for-mobility.net*

Heavy Duty Diesel Emissions Control Symposium. Göteborg, Sweden 21-22 September 2010. Information: *www.sae.org/events/training/symposia/hddec/*

CLRTAP Working Group on Strategies and Review. Geneva, Switzerland, 30 August-3 September 2010. Information: *www.unece.org/env/lrtap*

Air Quality Management in European Regions – challenges and success stories. Essen, Germany, 9 September 2010. Information: *www.umwelt.nrw.de/umwelt/umwelt_gesundheit/apug_nrw/index.php*

15th IUAPPA World Congress. Vancouver, Canada. 11-16 September 2010. Information: *www.IUAPPA2010.com*

IMO MEPC 61. London, UK, 27 September-1 October, 2010. Information: *www.imo.org*

European Transport Conference 2010. Glasgow, Scotland, 11-13 October 2010. Information: *www.aetransport.org/Ic_cms/page_view.asp?id=22*

Acid Rain 2010 Conference. Beijing, China, 18-22 October 2010. Information: *www.acidrain-2010.org*

Better Air Quality (BAQ) 2010. Singapore, 9-11 November 2010. Information: *www.cleanairinitiative.org*

UN FCCC COP 16 and CMP 6. Cancun, Mexico, 29 November-10 December 2010. Information: *unfccc.int/*

Fourth International Conference on Plants & Environmental Pollution. Lucknow, India, 8-11 December 2010. Information: *isebindia.com*

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